

IN THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

1-13. (Cancelled)

14. A combination flame and corona head for enhancing surface bonding properties of a substrate comprising:

a corona electrode for generating a corona by electrically charging an area between said electrode and a complementary electrode; and

at least one opening in the corona electrode for providing a combustible gas in the area of the corona,

said corona electrode facilitating generation of a corona and a flame within a common area.

15. The combination flame and corona head according to claim 14 wherein the substrate is located between said corona electrode and the complementary electrode, and

the substrate is simultaneously treated with corona ions from the corona and combustion ions upon ignition of the combustible gas

thereby enhancing the surface bonding properties of the substrate.

16. The combination flame and coronal head according to claim 15 wherein the complementary electrode is cylindrical,

the combination head generates the corona and flame in the common area corresponding to an arc portion of the cylindrical complementary electrode, and

said corona electrode has a curved surface corresponding to the arc portion of the cylindrical complementary electrode.

17. The combination flame and corona head according to claim 16 wherein the combination head is a component of a device for enhancing surface bonding properties of a plurality of cylindrical substrates and the device further comprises

a plurality of regularly spaced cylindrical complementary electrodes moving in a planar direction relative to said combination flame and corona head wherein each of the plurality of substrates is cylindrical and removably attaches to each of the plurality of corresponding complementary cylindrical electrodes; and

a controller for pausing the planar movement of each of the plurality cylindrical complementary electrodes at a predetermined position relative to said combination head thereby providing a predetermined gap of substantially constant distance between the curved electrode of the combination head and each cylindrical complementary electrode while paused in close proximity, while providing for the planar movement of the cylindrical complementary electrodes relative the combination head without movement of the combination head.

18. An enhanced head for generating a corona comprising:

a corona electrode for generating an ion field when electrified and placed in proximity with a complementary electrode, the ion field for treating the surface of a substrate located between the corona electrode and complementary electrode; and

an orifice for generating an air jet for constraining the location of the ion field.

19. The enhanced head according to claim 18 wherein

said corona electrode has two parallel sides; and

said orifice includes a first and second opening for generating first and second air jets in substantial proximity with the two parallel sides wherein the ion field substantially contained within the first and second air jets.

20. The enhance head according to claim 18 wherein
said corona electrode has a leading edge and a trailing edge,
the substrate moves through the generated ion field by entering at the leading edge
and exiting at the trailing edge and
said orifice includes an opening for generating a trailing edge air jet in substantial
proximity with trailing edge of said corona electrode wherein the ion field is substantially
contained within the trailing edge of the air jet.
21. The enhanced head according to claim 20 further comprising
a flame orifice located in substantial proximity with the leading edge of said corona
electrode for generating a flame for treating the surface of the substrate.
22. The enhanced head according to claim 20 wherein the ion field heats the substrate
and the air jet further cools the substrate upon exiting the ion field.
23. The enhanced head according to claim 22 further comprising an air cooler connected
to the enhanced head for the air cooling air prior to passing through the opening of said
orifice.